

RFK-3088B(CIP)

ABSTRACT OF THE DISCLOSURE

Solid membranes comprising an intimate, gas-impervious, multi-phase mixture of an electronically-conductive material and an oxygen ion-conductive material and/or a mixed metal oxide of a perovskite structure are described. Electrochemical reactor components, such as reactor cells, and electrochemical reactors are also described for transporting oxygen from any oxygen-containing gas to any gas or mixture of gases that consume oxygen. The reactor cells generally comprise first and second zones separated by an element having a first surface capable of reducing oxygen to oxygen ions, a second surface capable of reacting oxygen ions with an oxygen-consuming gas, an electron-conductive path between the first and second surfaces and an oxygen ion-conductive path between the first and second surfaces. The element may further comprise (1) a porous substrate, (2) an electron-conductive metal, metal oxide or mixture thereof and/or (3) a catalyst. The reactor cell may further comprise a catalyst in the zone which comprises a passageway from an entrance end to an exit end of the element. Processes described which may be conducted with the disclosed reactor cells and reactors include, for example, the partial oxidation of methane to produce unsaturated compounds or synthesis gas, the partial oxidation of ethane, substitution of aromatic compounds, extraction of oxygen from oxygen-containing gases, including oxidized gases, ammoxidation of methane, etc. The extraction of oxygen from oxidized gases may be used for flue or exhaust gas cleanup.